REMARKS

Please reconsider this application in view of the amendments and the remarks. Applicant thanks the Examiner for carefully reviewing this application.

Preliminary Matter

Pursuant to a substitute power of attorney filed herewith, please direct all future communications to Osha Liang LLP (customer number **22511**), with attorney docket No. **17452/017001**.

Disposition of the claims

Claims 1-24 are pending. Claims 1 and 17 are independent. The remaining claims depend, directly or indirectly, from claim 1 or 17.

Claim amendments

Claims 1-24 have been amended to clarify the inventions recited. No new matter is introduced by these amendments.

Priority

Examiner noted that certified copies of PCT/FR03/003687 and FR02/16276 priority documents have not been submitted. Applicant respectfully notes that the present application is a national stage application, under 35 U.S.C. § 371, based on PCT/FR03/003687, which claims priority of FR02/16276. The priority document FR02/16276 was filed at the international stage on August 5, 2004.

According to M.P.E.P. § 1896, upon receipt of applicant's submission to enter the U.S. national stage, the USPTO will request from WIPO a copy of the certified priority document submitted in the international stage. If a copy of the foreign priority document is not in the national stage application file but applicant asserts that a certified copy of the priority document was timely furnished under PCT Rule 17 in the international phase, then the examiner should consult with a Special Program Examiner in his or her Technology Center or a PCT Special Program Examiner.

Therefore, Applicant believes that there is no need to provide another certified copy of the priority document.

Specification Objection

The hyper link in the specification has been deleted, as suggested by the Examiner. Accordingly, withdrawal of this objection is respectfully requested.

Claim Rejections under 35 U.S.C. § 103(a)

Claims 1-15 and 17-24

Claims 1-15 and 17-24 are ejected under 35 U.S.C. § 103(a) as being obvious over Gorecki et al. ("New SNOM sensor using optical feedback in a VCSEL-based compound-cavity") in view of Naruse et al. ("Parallel confocal laser microscope system using smart pixel arrays"). Claims 1-15 and 17-24 have been amended. To the extent that this rejection may still apply to the amended claims, this rejection is respectfully traversed.

To establish *prima facie* obviousness of a claimed invention, all the claim limitations must be shown or suggested by the prior art. *In re Royka*, 490 F.2d 981, 180 USPQ (C.C.P.A., 1074).

Embodiments of the present invention relate to parallel confocal laser microscopy systems. Confocal microscopy is achieved by focusing a light beam at a point in a sample and detecting the return signal using a spatial pinhole to eliminate out-of-focus light. In a conventional confocal system, the pinhole filter and the detector are separate from the light source and return signals would travel a different path to reach the detector, as illustrated in FIG. 1. In contrast, a parallel confocal laser microscopy system in accordance with embodiments of the invention has the light source, the pinhole filter, and the detector aligned on the same axis such that the light traveling to the sample and the signal returning from the sample would travel the same path. This is made possible by using VCSEL as a light source and its beam outlet as the pinhole filter.

As shown in FIG. 2, a parallel confocal laser microscopy system (2) in accordance with embodiments of the invention includes a VCSEL vertical cavity laser array (23) for emitting light beams and an optical element (24) for focusing the light beams onto an object (25) to be observed. A system in accordance with embodiments of the invention is characterized in that a photodetector (22) is arranged behind each VCSEL laser such that the photodetector is capable of receiving a light beam backscattered from the object (25) via the VCSEL laser cavity, the cavity having an opening acting as filtering hole. (FIG. 2 and Abstract).

FIG. 4a (reproduced below) shows an electronic component according to one embodiment of the invention comprising a photodetector and a VCSEL laser, which may be produced by epitaxial growth on the same substrate. I n this embodiment, the photodetector is arranged on the rear face of the laser opposite to the emission face of the laser. FIG. 4b (reproduced below) is a front view of the electronic component of FIG. 4a. It shows in particular the cavity opening of the VCSEL laser through which the light beam is emitted. The return signal would also pass through this cavity opening to reach the photodetector. (Paragraph [0065]). Thus, the cavity opening of the VCSEL functions as a pinhole filter in confocal microscopy.

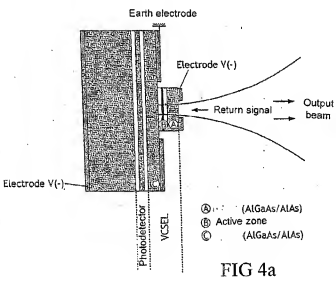


FIG 4a

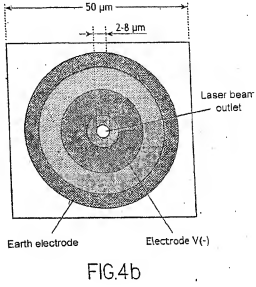


FIG.4b

With the novel configurations (i.e., sources array, pinhole, and detectors array all packed in one) proposed in the present application, it becomes possible to make a very compact microscope head for *in vivo* applications, for example for use with an endoscope. (paragraph [0014]). These configurations also allow for scanning of the VCSEL/Detector element instead of

scanning (moving) a sample. This is important for *in vivo* applications because the living tissues cannot be scanned (moved).

Specifically, independent claim 1 requires, *inter alia*, "an array of vertical-cavity lasers (VCSEL) for emitting light beams, and an optical means for focusing the light beams onto an object to be observed, wherein a photodetector is arranged on one face of each VCSEL laser such that the photodetector is capable of receiving a light beam originating from said object via a cavity of the VCSEL laser, the cavity having an opening used as a filtering hole."

Similarly, claim 17 requires, *inter alia*, "emitting a plurality of light beams from an array of VCSEL vertical cavity lasers; focusing the light beams on an object to be observed; and receiving, by a photodetector arranged on a face of each VCSEL laser, a light beam originating from the object via a cavity of the VCSEL laser wherein an opening of the cavity is used as a filtering hole for the light beam originating from the object."

Gorecki et al. discloses a VCSEL cavity used for illuminating a sample in an SNOM configuration. SNOM (near-field scanning optical microscope) allows for surface inspection with high spatial, spectral and temporal resolution by placing the detector very close (at a distance smaller than wavelength λ) to the specimen surface. However, SNOM is different from confocal microscopy. Gorecki et al. also teaches a VCSEL cavity having a PIN detector (a PiN diode) on the rear side. Even though these features seem similar to those described in the present application, there are significant differences:

- A system of the invention uses the exit opening of a VCSEL cavity as a confocal pinhole useful for spatial filtering. Because Gorecki et al. does

not deal with confocal microscopy, it does not disclose any spatial filtering.

- A system of the invention uses optical elements (such as lenses) for focusing the illuminating beam onto the sample. Focusing is necessary in confocal microscopy, but not in SNOM. Thus, Gorecki et al. does not teach or suggest any focusing optics.
- A system of the invention scans VCSEL/detector or the focusing optics to build an image. In SNOM, the sample is scanned (moved) not the tip (i.e. the VCSEL). Although Gorecki et al. mentioned (page 122) that the tip (with the VCSEL and detector) can be scanned, if the sample is bulky. In this case, the scanning speed and the Field of View (FOV) would be very different. Scanning speed for SNOM is very low (for keeping the tip "alive" during the experiment) and the FOV is also very small (several microns). In contrast, embodiments of the invention can scan very quickly a field of view of several hundreds of microns.
- A system of the invention uses an array of VCSEL, whereas the SNOM configuration disclosed in Gorecki et al. uses a single VCSEL.

Therefore, Gorecki et al. fails to discloses "an array of vertical-cavity lasers (VCSEL) for emitting light beams, and an optical means for focusing the light beams onto an object to be observed, wherein a photodetector is arranged on one face of each VCSEL laser such that the photodetector is capable of receiving a light beam originating from said object via a cavity of the VCSEL laser, the cavity having an opening used as a filtering hole," as required by claim 1.

Similarly, Gorecki et al. fails to disclose, at least, "focusing the light beams on an object to be observed; and receiving, by a photodetector arranged on a face of each VCSEL laser, a light beam originating from the object via a cavity of the VCSEL laser wherein an opening of

the cavity is used as a filtering hole for the light beam originating from the object," as required by independent claim 17.

Naruse et al. does not teach or suggest that which is missing in Gorecki et al.

Naruse et al. discloses a parallel confocal microscope that uses an array of VCSEL emitting elements for illuminating the sample and an array of photodetector elements for detecting the photons coming back from the sample. In front of the array of detectors, a pinhole array is used for spatial filtering (giving the confocal capability to the microscope). Even though Naruse et al. discloses arrays of VCSEL and detectors, the approach of Naruse et al. is conventional, as discussed in the present specification and illustrated in Fig. 1. Specifically, Naruse et al. teachings are different form those described in the present invention in the following aspects:

- The illuminating and detecting elements are separated in the Naruse architecture.
- The pinhole is separated from the VCSEL cavity. It's an independent component in the Naruse configuration.
- Embodiments of the invention scan the VCSEL/detector component to build an image. In the Naruse case, they need to scan the sample. Otherwise, they would have to scan the illuminating arm and the detection arm in the same manner, simultaneously with a high precision synchronization which is very complicated.

Therefore, Naruse et al. fails to teach or suggest what is missing in Gorecki et al., i.e., "wherein a photodetector is arranged on one face of each VCSEL laser such that the

photodetector is capable of receiving a light beam originating from said object via a cavity of the VCSEL laser, the cavity having an opening used as a filtering hole," as required by claim 1.

Similarly, Naruse et al. also fails to disclose "receiving, by a photodetector arranged on a face of each VCSEL laser, a light beam originating from the object via a cavity of the VCSEL laser wherein an opening of the cavity is used as a filtering hole for the light beam originating from the object," as required by independent claim 17.

For reasons set forth above, Gorecki et al. and Naruse et al., whether considered separately or in combination, would not teach every limitation of claim 1 and claim 17. Therefore, claims 1 and 17 are patentable over Gorecki et al. in view of Naruse et al. Dependent claims 2-15 and 18-24 should also be patentable for at least the same reasons. Accordingly, withdrawal of this rejection is respectfully requested.

Claim 16

Claim 16 is ejected under 35 U.S.C. § 103(a) as being obvious over Gorecki et al. in view of Naruse et al. as applied to claim 15 above, and further in view of Schwarz et al. ("Simple reflection Scanning Near-Field Optical Microscope using the back reflected light inside the laser cavity as detection mode"). Claim 16 depends indirectly from claim 1 and has been amended. To the extent that this rejection may still apply to the amended claims, this rejection is respectfully traversed.

As noted above, Gorecki et al. in view of Naruse et al. fails to teach or suggest every limitation of independent claim 1. Schwarz et al. does not provide that which is missing in

Gorecki et al. and Naruse et al., as evidenced by the fact that the Examiner relies upon Schwarz et al. for the teaching of using optical fiber.

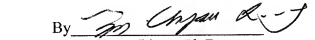
Therefore, a combination of Gorecki et al., Naruse et al., and Schwarz et al. would not teach every limitation of claim 1. Thus, claim 16, which depends indirectly from claim 1, should be patentable over Gorecki et al. in view of Naruse et al., and further in view of Schwarz et al. Accordingly, withdrawal of this rejection is respectfully requested.

Conclusion

Applicant believes this reply is fully responsive to all outstanding issues and places this application in condition for allowance. If this belief is incorrect, or other issues arise, the Examiner is encouraged to contact the undersigned or his associates at the telephone number listed below. Please apply any charges not covered, or any credits, to Deposit Account 50-0591 (Reference Number 17452/017001).

Dated: November 4, 2009

Respectfully submitted,

By 

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